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# First report of a Giant manta ray, *Mobula birostris* (Walbaum 1792), foetus from Kochi, Kerala, India

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Short Communication

## Abstract

With information on the Giant Manta Ray scanty, a record of morphological and morphometric data on *Mobula* foetus from this region is very important. The disc length (DL) of the foetus recorded in Kochi was only 30 mm and the foetus already had pigmentation patterns in the ventral portion of the cephalic horn and displayed the presence of an umbilical attachment. This data reinforces the importance of the west coast as a potential reproduction ground for *M. birostris* and is crucial for the establishment and progression of conservation measures for this migratory species.

**Keywords:** *Mobula birostris*. Foetus, Northeast Arabian Sea, manta, first description

## Introduction

The Giant Manta Ray (*Mobula birostris*) is a large marine vertebrate with a disc width reported up to 910 cm (White *et al.*, 2006) and a weight of 2.0 t (Kunjipalu and Boopendranath, 1981). Manta rays are found over continental shelves and near oceanic islands widely diffused in all oceans and adjacent seas, often extending their range into warm temperate latitudes. This species is reportedly the largest among the genus *Mobula*. Mobulids are filter feeders, unfurling the cephalic horns out front and funnelling water towards their mouths to extract the tiny animals they eat. *M. birostris* rays are assessed as Vulnerable by the International Union for Conservation of Nature (Marshall *et al.*, 2018). Manta rays are assessed as Vulnerable because they are often targeted by fishers for their gill plates which

are used in the preparation of a pseudo-medicinal soup called Peng Yu Sai made of boiled manta gills, seahorses, and pipefish and is said to be a remedy for fever, chickenpox and breastfeeding mothers (O'Malley *et al.*, 2016). However, large numbers of devil rays die accidentally when caught as bycatch each year as they become entangled in fishing nets while foraging for food. Species of the genus *Mobula* have a very low reproductive capacity and are ovoviviparous with a long gestation period of one and a half years (Marshall *et al.*, 2008; Herbert, 2012; Mendonça *et al.*, 2012) and a reproductive potential of one pup (Notarbartolo di Sciarra and Serena, 1988). India along with Indonesia, and Sri Lanka comprise the top three manta fishing countries and account for an estimated 90% of the world's manta catch and target mantas for their gill plates. However, commerce in gill plates is not well documented (Raje *et al.*, 2002), although an estimate of the total volume of the gill plate trade has been produced from an analysis of market surveys in the major manta ray gill plate markets (Nair *et al.*, 2013). During the year 2020, an estimated 12438 t of rays were landed in India and 2021, an estimated 133 t of *M. birostris* was landed in Kerala (CMFRI, 2021). The objective of this study is to record the measurements of a *M. birostris* foetus of the female caught accidentally in the region of Kochi, Kerala from the Northeast Arabian Sea. This is the first record of a *Mobula* sp. foetus from this region with its morphological and morphometric data.

This report presents new diagnostic features for *Mobula birostris* foetus and is the first report from Indian waters. The present study provides short taxonomic accounts with morphometric data for the species, along with photographs.

## Material and methods

During the regular fishery monitoring programme of the ICAR-Central Marine Fisheries Research Institute, the landing of 20 individuals of the species of *M. birostris* at Kochi Fisheries Harbour, which was caught incidentally in the gillnets operated off Kerala on the North East Arabian Sea were recorded on 20 November 2021. Measurements of the adult pregnant mobulid ray were recorded on the field (Table 1) and the gill plates and the abdominal cavity were also examined for the collection of samples including stomach contents. A foetus was detected inside on dissection of the uterus since the uterus was dilated. The foetus was subsequently removed and transferred to the Laboratory of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI). In the laboratory, 21 morphological measurements were recorded as per Marshall *et al.* (2008). Following this, the foetus was fixed in 4% formaldehyde and deposited in the collection of

Table 1. Morphometry in mm of the *Mobula birostris* embryo and adult collected in the Kochi Fisheries Harbour and (expressed in % DW)

| Morphometry parameters (mm)                                 | Unit   | % DW    |
|---|--------|---------|
| <b>Adult</b>  |        |         |
| Total Length  | 2743.2 |         |
| Disc length   | 1423.1 |         |
| Disc width  | 2876.4 |         |
| Horn length   | 460.2  | 15.999  |
| Inter horn length   | 61.3   | 21.311  |
| Mouth length  | 54.85  | 19.069  |
| Gill slit length  | 385    | 13.385  |
| Total slits top to bottom length                            | 414.3  | 14.403  |
| Last slit length  | 275.4  | 9.574   |
| Inter gill slit length                                      | 373.3  | 12.978  |
| Tail length   | 1310.1 | 45.547  |
| <b>Pup</b>  |        |         |
| Total Length  | 18.8   |         |
| Length of disc  | 15.8   |         |
| Disc length till insertion                                  | 12.5   |         |
| Disc width  | 30     |         |
| Snout length  | 4.8    | 16.000  |
| Eye diameter (Horizontal)                                   | 0.6    | 2.000   |
| Eye diameter (Vertical)                                     | 0.8    | 2.667   |
| Interorbital distance                                       | 7.7    | 25.667  |
| Mouth width   | 4.4    | 14.667  |
| Tail length   | 47.5   | 158.333 |
| Insertion point of spine                                    | 18     | 60.000  |
| Head length (tip of snout to inner end of 1st gill opening) | 5.5    | 18.333  |

| Morphometry parameters (mm)   | Unit  | % DW   |
|---|-------|--------|
| Gill slits (horizontal distance between 1st gill slits)             | 3.9   | 13.000 |
| Gill slits (horizontal distance between 2 <sup>nd</sup> gill slits) | 3.6   | 12.000 |
| Gill slits (horizontal distance between 3 <sup>rd</sup> gill slits) | 3.1   | 10.333 |
| Gill slits (horizontal distance between 4th gill slits)             | 2.4   | 8.000  |
| Gill slits (horizontal distance between 5 <sup>th</sup> gill slits) | 1.4   | 4.667  |
| Snout to anus   | 16.4  | 54.667 |
| Pre oral distance   | 12.4  | 41.333 |
| Tail width at base of sting   | 0.37  | 1.233  |
| Tail height at base of sting  | 0.352 | 1.173  |
| Sting length  | 1.242 | 4.140  |
| Pectoral insertion to sting origin                                  | 1.944 | 6.480  |
| Clasper length  | 1.7   | 5.667  |
| Upper toothband length  | 3.5   | 11.667 |
| Lower toothband length  | 3.4   | 11.333 |
| Anterior projection   | 4.2   | 14.000 |
| Pre dorsal distance   | 14.4  | 48.000 |
| Dorsal fin base length  | 1.5   | 5.000  |
| Dorsal fin vertical height  | 2     | 6.667  |
| First interbranchial  | 2     | 6.667  |
| Fifth interbranchial  | 1.3   | 4.333  |
| Cephalic fin length   | 3     | 10.000 |
| Cephalic fin width  | 2.2   | 7.333  |

the Fisheries Division Laboratory. Additionally, the proportions of the body were calculated based on the percentage of the disc width (% DW). The identification of species was made according to Notarbartolo di Sciara (1987); Di Sciara, 2016; Serena (2005); and Capapé *et al.* (2015). The lengths (disc width, disc length, total length, *etc.*) were measured to the nearest 0.1 cm and the weight to the nearest kilogram (kg). The freshly collected specimens were photographed, and a small piece of white muscle tissue from the ventral surface was collected for DNA isolation, later fixed in formalin, and stored for future reference. This report defines new morphometric and diagnostic features for *M. birostris* foetus; this is the first report from Indian waters

**Specimen examined:** FFD 2022 -1, 274.32 mm TL; 287.64 mm DW, male, collected from gill net catch, 22° 17' 59" N, 68° 07' 92" E as a bycatch of tuna landings off Calicut, landed at Kochi Fisheries Harbour. Collection date: 20 November 2021. The morphometric measurements of *M. birostris* were compared with those of Ishihara *et al.* (1993). The current study material was deposited in the Finfish Fisheries Division Laboratory of the ICAR -Central Marine Fisheries Research Institute (CMFRI), Kochi, Kerala, India.

## Results

The adult *M. birostris* is easily recognised by the absence of a white marking on the black dorsal fin which distinguishes it from the *M. mobular*. Though there are reports of adult landings in the different harbours, there are no reports of *Mobula* foetus from Indian waters. The one available in the literature is of a foetus with a disc length of 586 mm, a disc width of 1370 mm and a total weight of 23.6 kg from Tumbes, Peru (Cabanillas *et al.*, 2019). On dissection of the adult, the foetus was observed in total (Fig. 1). The mobulid displayed a fleshy colour on the dorsal surface; the ventral surface displayed a whitish-creamy colour and a slight pinkish tone on the dorsal surface. A pigmentation pattern was noticed on the cephalic fin tip as a band (Fig. 2) and the outer surfaces of the cephalic fins were primarily skin tone in colour. Colours became fainter posterior to the gill openings. Darker tones were observed from the cloaca to the tips of the pectoral fins. Markings of the gill filaments were visible through the skin on the dorsal surface as darker tones. (Fig. 2). Eyes were present



Fig. 1. Dorsal view of *M. birostris* foetus. FFD 2022 -1 collected from Kochi Fisheries Harbour



Fig. 2. Cephalic fin tip of *M. birostris* foetus



Fig. 3. Ventral side showing insertion point of the umbilical stalk of *M. birostris* foetus

as two dark black balls placed laterally. An umbilical-like stalk was noticed which terminated in a 10 mm reddish navel on the ventral side (Fig. 3). The umbilical stalk was inserted at the point below gill slits on the ventral surface. The tail had a caudal spine at its base, a character key for *M. birostris* (Fig. 1). Patches of dermal denticles were present in the ventral and dorsal surfaces of the body. The disc length (DL) of the foetus recorded in Kochi was only 30 mm which was much smaller compared to the record of Peru (586 mm) and quite similar to that recorded in Ecuador (180 mm) representing 108.52% of the DL. However, the recorded weights display a much greater variation with the present foetus weighing only 265 g. Those recorded in Peru were substantially higher (185.83%) than those reported from Ecuador. These biometric differences could be due to possible differential stages in growth.

Dewar *et al.* (2008) suggest that the presence of *M. birostris* is directly related to the productivity of the area, which further indicates that the Western coast of India is a highly productive area of the Western Indian Ocean. In the year 2021, an estimated 133 t of *M. birostris* was landed in Kerala alone. Besides the gravid manta indicated there have been previously recorded instances of other mobulids between August 2012 and May 2013 in this area. This indicates that the occurrence of gravid mantas is not an exclusive event. Together with our recent findings, and previous records, this data reinforces the importance of the west coast of India as a potential reproduction ground for *M. birostris*. This information gathered from the west coast of India is crucial for the establishment and progression of conservation measures for this migratory species.

Researchers believe that sexually mature female giant devil rays have an average wing-to-wing span of 16.5 feet (Stevens *et al.*, 2018). The average measurement of a newborn pup is 1.0 m (3.28 feet). There have been very few studies on the reproductive biology of this species; hence the results reported in this study

tally with this reproductive record. Regarding the weight and size at birth, the two captive mobulas born in Japan in 2007 (Okinawa Churaumi Aquarium) had disc widths of 1.8 and 1.9 m, and the latter one weighed 68.5 kg. Hence, it could indicate that the foetus described herein (DW=125 mm; weight: 265 g) was in a primitive stage of foetal development. In addition, it was observed that the foetus already had pigmentation patterns in the ventral portion of the cephalic horn. In *M. birostris*, these patterns develop before being born, however, it cannot be confirmed that the registered patterns are definitive, as given by Marshall *et al.* (2008). The foetus of *M. birostris* displayed the presence of an umbilical attachment, which was the remnant of the yolk sac, which is similar to that reported by Marshall *et al.* (2008). Besides this, the *M. birostris* has been regularly recorded from the west coast of India (CMFRI, 2021). This indicated that the gravid female recorded is not an isolated event and there might be more such cases, which may have gone unrecorded. Together with our recent findings, and previous records, this information is crucial for the establishment and progression of conservation measures for this migratory species.

The marine fish landings data used in this study/publication are research data of ICAR-CMFRI collected through diachronic primary surveys following a stratified multistage random sampling design across the coastline of mainland India.

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